

The Reproductive System

Reproduction is the process of producing new individuals of the same kind.

Reproduction is the process of formation of new individuals by sexual or asexual means, which can repeat the process in their own turn.

Many simpler organisms like bacteria and yeast reproduce by fission or budding, etc. Many plants reproduce vegetatively non-sexually by various methods.

PATTERNS OF REPRODUCTION

(i) Asexual reproduction

Under this mode of reproduction, the reproductive units may consist of any portion of the parent body. For Ex- The simple single-celled organism Amoeba reproduces asexually by fission. In Hydra, reproduction takes place by means of small buds.

(ii) Sexual reproduction

Most higher organisms, including humans, reproduce sexually by the production of gametes.

The gametes are very small and are usually produced in **male and female sexes** respectively. The gametes must normally unite to produce a zygote which, through a process of development, finally becomes the offspring.

REPRODUCTION IN HUMANS

The organs of the reproductive system are divided into the primary and accessory parts:

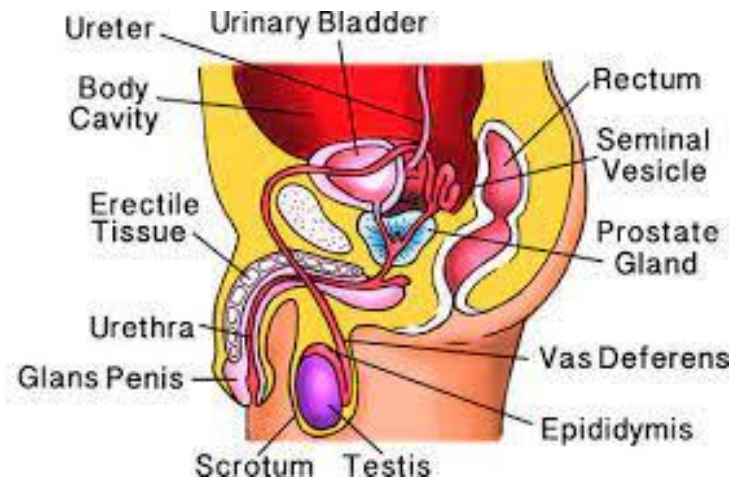
(i) The primary reproductive parts include the **gonads** which produce the sex cells the sperms and eggs.

(ii) The accessory reproductive parts include all those structures, ducts and glands which **help in the transfer and meeting of the two kinds of sex cells** leading to fertilisation and in the growth and development of the egg up to the birth of the baby.

Male Reproductive System

The male reproductive system consists of the following organs:

- (1) **Testes** (one pair) to produce sperms
- (2) **Sperm duct** (vas deferens) from each testis to carry the sperms
- (3) **Accessory glands** (seminal vesicles, prostate and bulbo-urethral glands) to contribute to the seminal fluid
- (4) **A penis** for transferring the sperms into the female vagina
- (5) **Urethra** contained inside the penis, conveys the sperms received from sperm ducts.



1. TESTES (sing. : testis)

A. Location of testes - scrotal sacs.

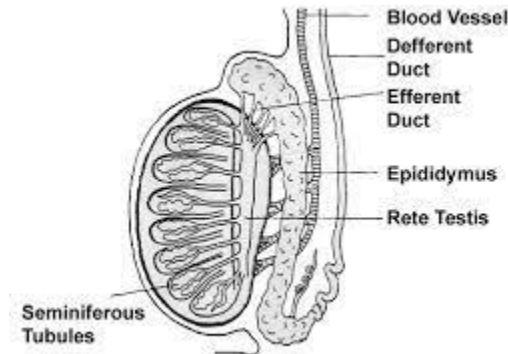
- In the embryonic stage, the testes are contained within the abdomen.

Temperature regulation in the testes

Sperms are produced in the testes at a temperature 2 to 3°C lower than that of the body. When it *is too hot*, the skin of the scrotum loosens so that the testes hang down away from the body. When *it is cold*, the skin contracts in a folded manner and draws the testes closer to the body for warmth.

B. Structure of testis

Each testis is encased in a capsule which is internally partitioned into around 250 lobules. Each lobule contains:



(i) **Seminiferous tubules** where the sperms are produced. The process is called *spermatogenesis*.

(ii) **Interstitial cells** which are packing tissues between the coils of the seminiferous tubules.

2. SPERM DUCTS

The sperm duct (vas deferens) from each testis travels upward into the abdomen passing through an inguinal canal.

3. ACCESSORY GLANDS

Three male accessory glands are as follows:

(i) **Seminal vesicles**- A pair of lobulated glands located between the posterior surface of the urinary bladder and the rectum.

• **Function** - Produce a secretion which serves as a medium for the transportation of the sperms. The mixture of this fluid and the sperms produces a milky fluid, the semen.

(ii) **Prostrate Gland** – a bilobed structure which surrounds Urethra.

Function- Makes semen alkaline so it neutralizes acid in vagina.

(iii) **Bulbo-urethral glands** (or Cowper's glands)-. These are two small ovoid glands which open into the urethra just before it enters the penis.

Function- The secretion serves as a lubricant.

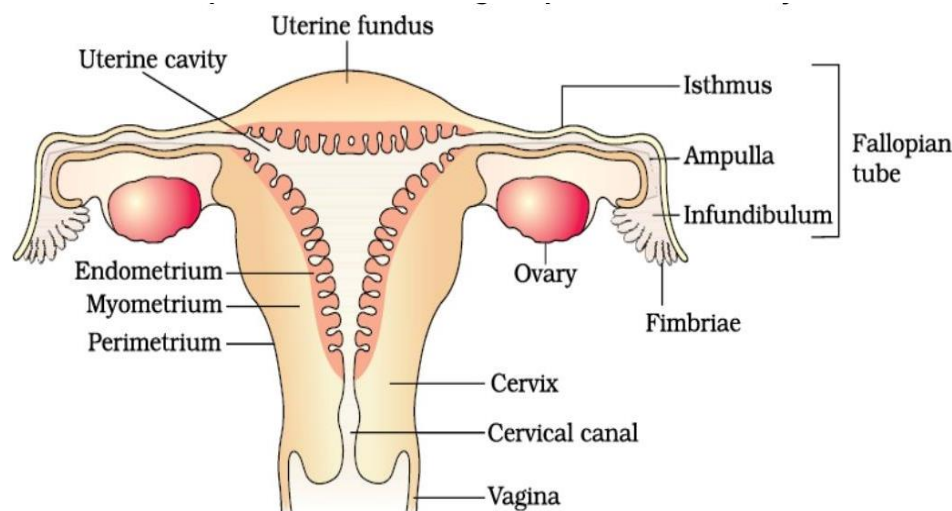
4. PENIS

The penis lies in front of the scrotum, cylindrical in shape, serves for the passing out of both semen and urine.

Female Reproductive System

The female reproductive system consist of the following reproductive organs.

1. A pair of **ovaries**
2. A pair of **oviducts** (or Fallopian tubes) to convey the egg released from the ovary



3. A sac-like or pear-shaped **uterus** for the growth and development of the embryo developed from the egg
4. A **vagina**, and
5. **Vulva**, the outermost part.

1. OVARIES

The two ovaries are small ovoid bodies. Their peripheral part produces ova or the eggs. Normally, only one egg matures in each ovary every alternate month. A maturing egg contained in a cellular sac is called the **follicle**. As the egg grows larger, the follicle also enlarges and gets filled with a fluid and is now called the **Graafian follicle**. When ripe, the follicle bulges over the surface of the ovary.

Oogenesis is the process in which the ova- producing cells give rise to the mature ovum.

2. OVIDUCTS

The two oviducts, also called **Fallopian tubes or uterine tubes**, are about 12 cm long. Near the corresponding ovary, each oviduct has a funnel shaped opening called the oviducal funnel.

3. UTERUS

Location between the urinary bladder and the rectum. It is hollow pear shaped organ where embryo develops.

4. VAGINA

The vagina is a muscular tube. The vagina receives the male penis during copulation. The great elasticity of its wall also allows the passage of the baby during childbirth. The opening of the vagina in

young females is partially closed by a thin membrane called hymen

5. VULVA

The external female genitalia is called the vulva.

Role of hormones in reproduction

The ovaries of a young girl start functioning around the age of 10 to 14 years. It starts releasing the ova (ovulation) and this stage in her life is known as puberty.

At about the same time as the first ovulation, the ovary also releases female sex hormones into the blood stream. These hormones, called oestrogens, are responsible for secondary sexual characteristics.

While another hormone secreted by the corpus luteum, progesterone prepares *the uterus for receiving the embryo*.

In boys, puberty takes place around the age of 11 to 15 years of age. The testes start producing testosterone, resulting in the development of secondary sexual characteristics.

Puberty

Puberty is the period during which immature reproductive system of boys and girls matures and becomes capable of reproducing. At age 10 in girls, first sign is the enlargement of breasts. In boys at 11 years, the enlargement of testes is the first sign.

MENSTRUAL CYCLE

The reproductive period of the human female continues from about the age of 13 years to 45-50 years. This period is marked by a characteristic event repeated almost every month (28 days with minor variation) in the form of a menstrual flow.

MENARCHE and MENOPAUSE

Menarche is the start of menstruation in a young female at about the age of 13 years (arche: beginning)

Menopause is the permanent stoppage of menstruation in females at about the age of 45 years (pause: stop).

The period of a menstrual cycle is counted from the day of the onset of the flow to the next onset after 28 days

(1) Menstrual phase: It lasts for 3-5 days during which blood is discharged. The bleeding is caused due to the shedding and

rupturing of the blood vessels that make up the thickened innermost lining of the uterus, called the endometrium.

(2) Follicular phase: As the follicle grows, the amount of oestrogens produced by the ovary increases. This hormone then acts on the uterus and causes its lining to become thicker and develop more blood vessels.

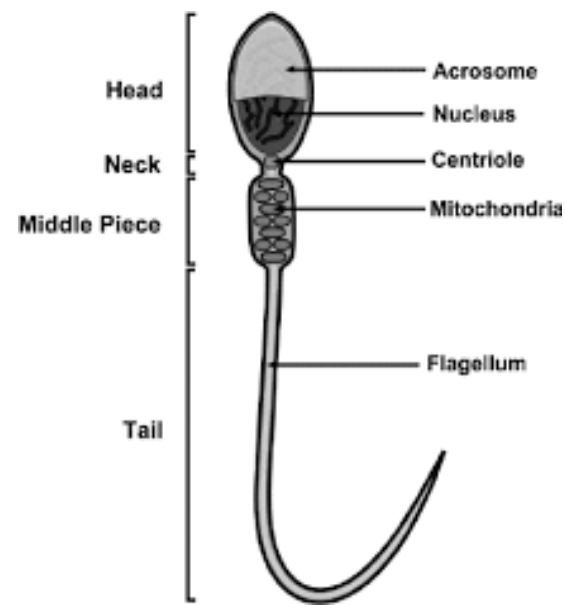
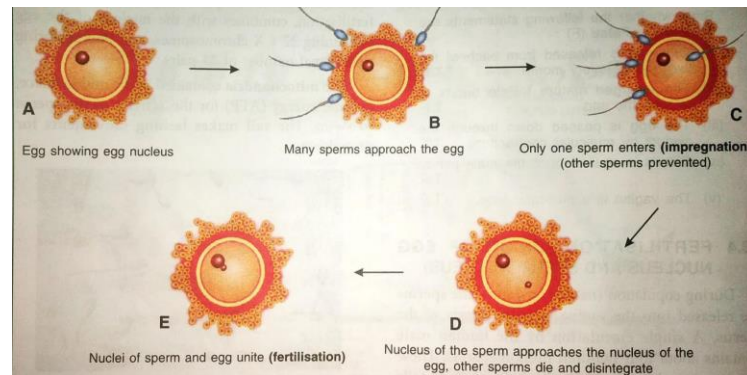
(3) Ovulatory phase: On about the 13th or 14th day, the follicle ruptures (ovulation) and the released egg travels down the oviduct.

(4) Luteal phase: It lasts from 15-28 days. Uterus lining thickens further and after the release of the ovum, the emptied follicle in the ovary turns into a hormone-producing tissue called **corpus luteum**.

FERTILISATION

During copulation the sperms are released into the vagina near the cervix of the uterus.

Fertilisation: The fusion of the male gamete (sperm) and female gamete (ovum) to form a zygote.



Functions of the main parts of a sperm

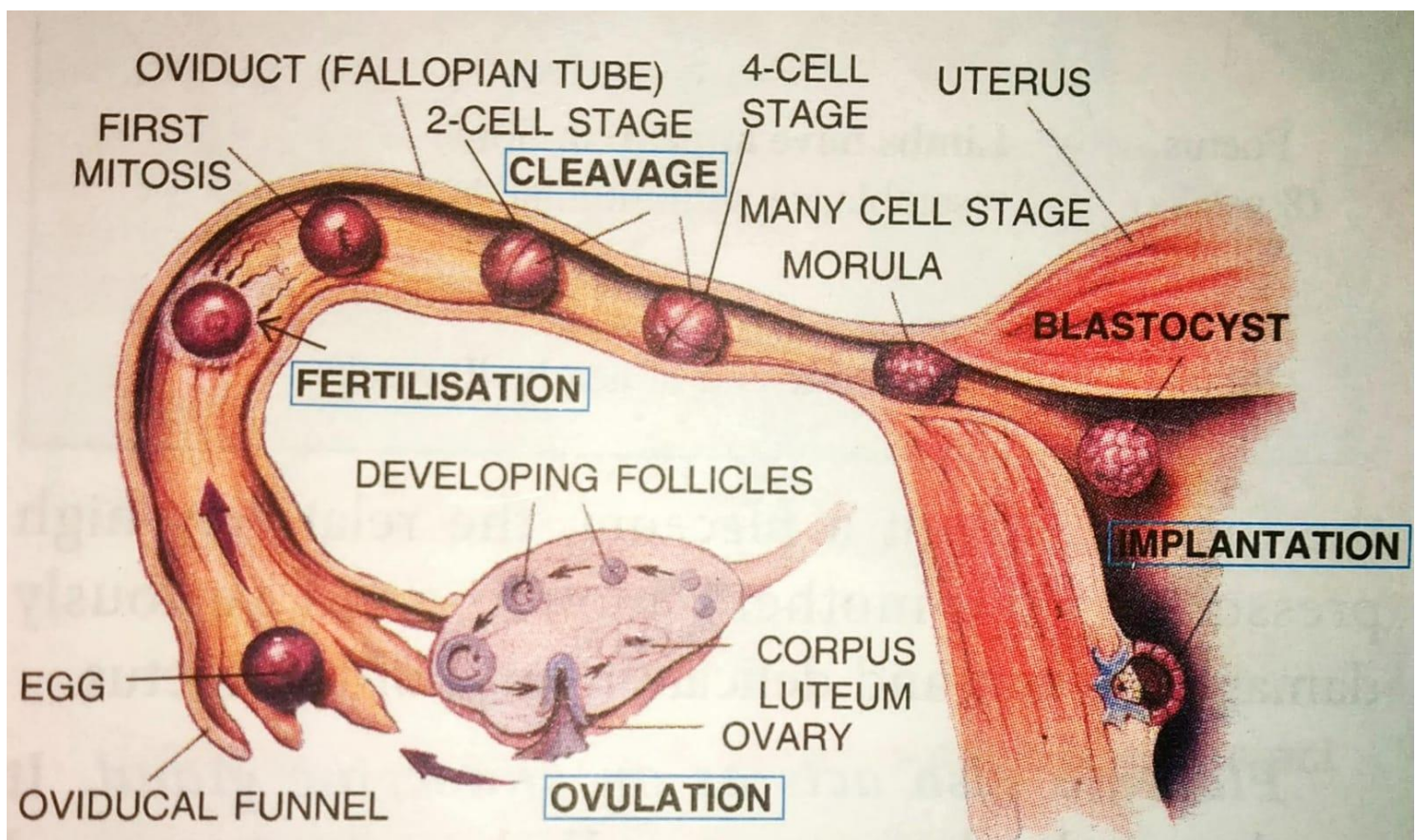
The acrosome at the top of the **head** of the sperm secretes an enzyme (hyaluronidase)

which facilitates entry of the sperm into the egg by dissolving the wall of the ovum.

The **nucleus** contains genetic material.

The **mitochondria** contained in the middle piece, provide energy (ATP) for the activity of the sperm to swim.

The **tail** makes lashing movements for propulsion.



IMPLANTATION (CONCEPTION) AND PREGNANCY

The **fertilised egg** (zygote) soon starts dividing (cleavage) into 2, 4, 8, 16 cells and so on. By the time it reaches the uterus, it has already formed a small hollow ball of numerous cells (**blastocyst**). This is a kind of embryo which forms a pit in the endometrial lining of the uterus and gets fixed in it in about a week's (5-7 days) time

after ovulation. This process is **called implantation** and it produces the state of pregnancy.

Implantation: The fixing of the blastocyst to the wall of the uterus/endometrium is termed implantation.

Embryo - a growing egg after fertilisation until the main parts of the body and the internal organs have started to take shape.

Foetus - When embryo starts having a look of a baby (from 7 weeks of gestation and onwards).

Pregnancy - The state of carrying the unborn young one inside the body.

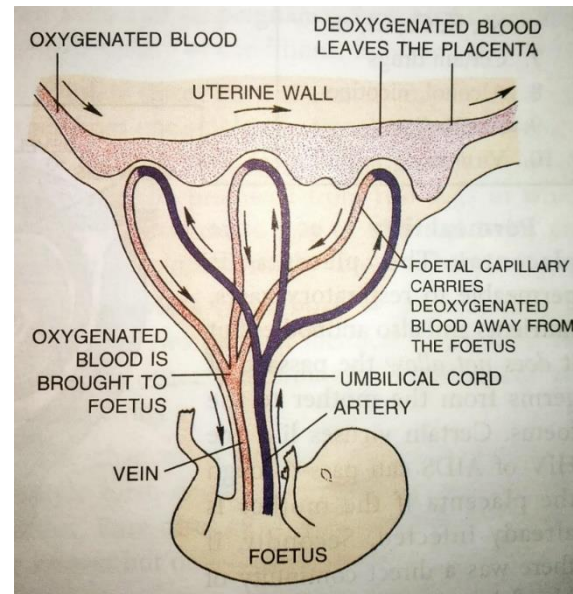
Amnion and Amniotic fluid.

Amnion is a sac which develops around the embryo even before the formation of allantois fluid :

1. Protects the embryo from physical damage by jerks or mechanical shocks. For example, when the mother falls over.
2. Keeps an even pressure all around the embryo.
3. Allows the foetus some restricted movement
4. Prevents sticking of the foetus to the amnion.

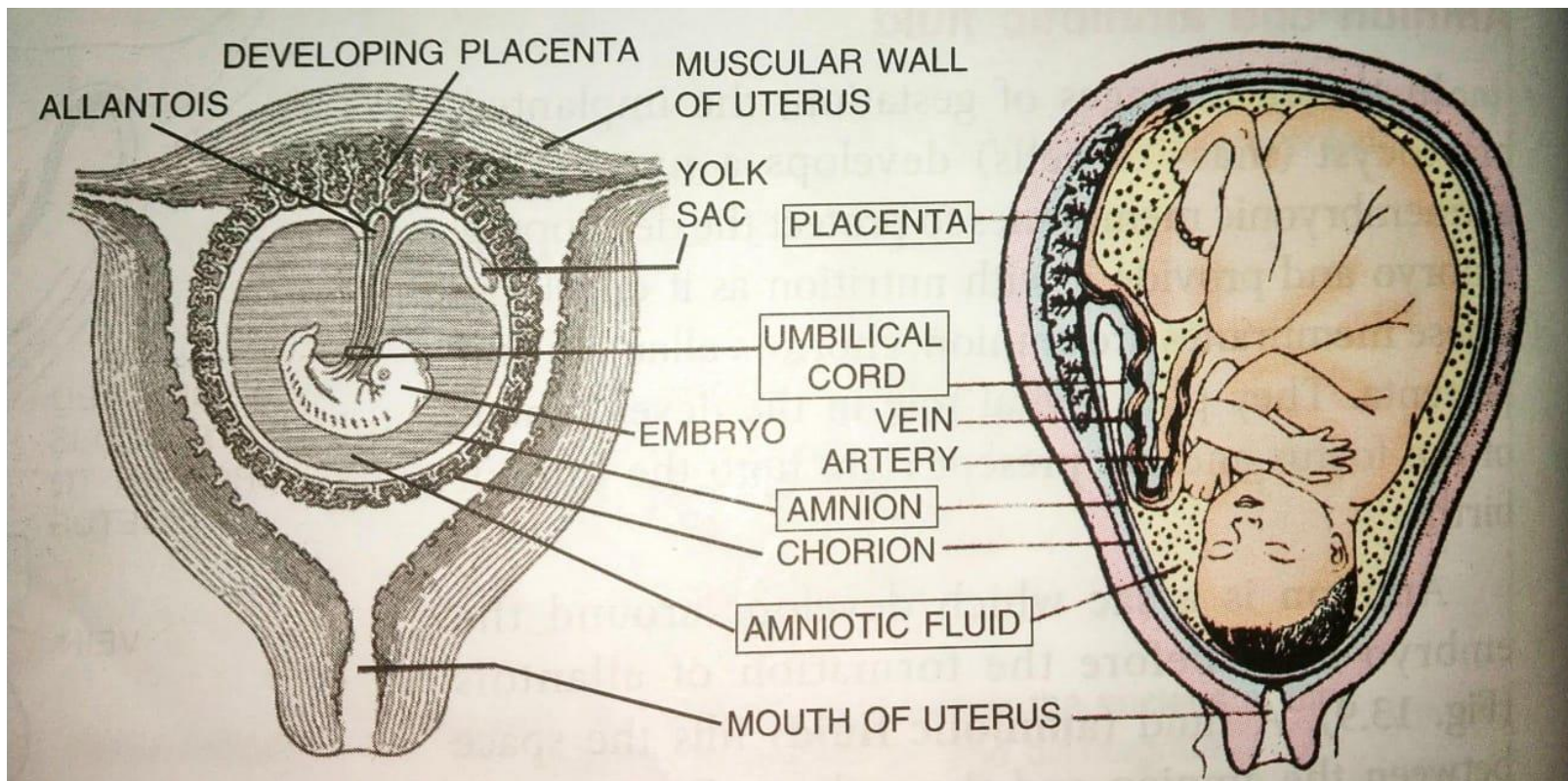
PLACENTA

Placenta is a disc-like structure attached to the uterine wall. A cord containing blood vessels connects the placenta with the foetus; this is called umbilical cord.



Parturition (Birth)

The full term of the development of the embryo in the uterus is called Gestation. In humans it lasts for 280 days.



Parturition is act of expelling the full term foetus from mothers uterus at the end of gestation.

Identical and fraternal twins

Sometime two eggs are released from ovaries and both get fertilized to produce 2 individuals called **fraternal twins**. These twins are not alike

If a single fertilized egg get split and separated into 2 parts during early stages of cell division then **Identical Twins** are produced. These twins are exactly alike.